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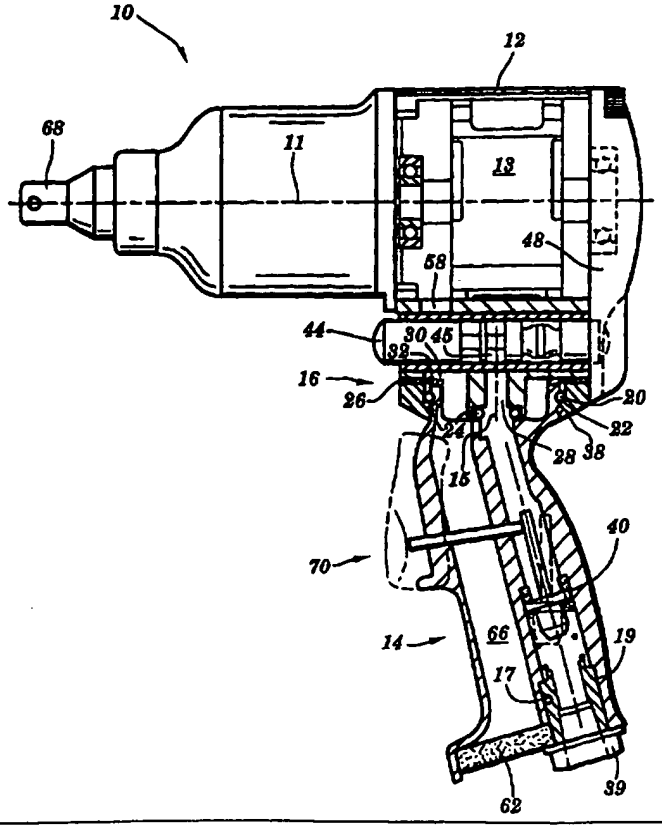
(54) Title: POWER HAND TOOL WITH ROTATABLE HANDLE

(57) Abstract

A hand held compressed air power tool (10) is provided with a handle (14) that can axially rotate about an orthogonal axis (15) perpendicular to the tool housing. Thus, the handle (14) can rotate independently of the motor housing (12) thereby allowing the handle (14) to point in a different direction other than toward the point of impact. The tool (10) utilizes a rotational coupling system (16) that allows the handle (14) to rotate while also allowing compressed air to be fed into, and exhausted out of, the tool (10) via the base of the handle (14).



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POWER HAND TOOL WITH ROTATABLE HANDLE

Field of the Invention

The present invention relates generally to hand-held power tools. In particular, the present invention is concerned with power hand tools with adjustable handles.

Background of the Invention

A re-occurring problem with hand-held power tools is arriving at tool handles that provide a convenient and comfortable hand/wrist position. For example, different tools may utilize a straight, side, angled or spade handle in order to achieve a correct hand/wrist position. The problem with this concept is that the operator has to do a variety of different jobs with the same tool. Thus, a straight handled tool may be ideal for one application but not ideal on another application where a turned or angle handle is better suited.

In an attempt to overcome this limitation, power tool developers and manufacturers have introduced adjustable type handles for their power tools. For example, U.S. Patent No. 4,522,270 issued to Kishi discloses a hand-held power tool which provides a handle that pivots angularly with respect to the tool housing.

Similarly, U.S. Patent No. 3,571,874 issued to Von Arx discloses a descaling device which also has a handle that pivots angularly with respect to the tool housing. These inventions allow the tool handle to be angularly pivoted toward or away from the tool attachment/impact point. For instance, the handle may be at a 90° position with respect to the tool housing for a first job (i.e., in a "pistol" type configuration) and then changed to a 180° angle with respect to the tool housing for a second job (i.e., in a straight line configuration). This gives the operator an increased ability in finding a more comfortable or efficient handle position which he or she lacked in the past.

While the aforementioned patents provide a certain amount of improvement, there are still problems which these devices do not address. For instance, given that most tools have a trigger on the handle, these devices do nothing to change the direction of the trigger on the handle with respect to the tool housing. In other words, the trigger always faces in the same direction -- towards the tool attachment/impact point. Under certain circumstances, in order to achieve the ideal hand/wrist position, an operator may want to have the trigger facing a direction other than that of the direction of the tool.

Until now, no power tool has existed which provides a handle that allows for axial rotation of the handle

about an axis perpendicular to the tool housing. The present invention seeks to provide this functionality.

Summary of the Invention

Briefly, the present invention provides a hand-held power tool with a handle that can freely rotate about an orthogonal axis perpendicular to the tool housing. The present invention comprises a tool housing, a handle, and a rotational coupling system connecting the tool handle to the tool housing. The coupling system comprises a system of grooves, circular rings, and gaskets which allows the handle to rotate independently of the tool housing. (Or conversely, the tool housing can rotate independently of the handle).

In addition, the present invention provides a means by which the above described hand-held tool can be powered by compressed air. The tool is constructed to receive the compressed air at the base of the handle, transport the air through the handle, through the rotational coupling system and into the tool housing where it drives a rotational motor. The air is then exhausted out of the tool housing back through the rotational coupling system and exhausted down through the handle where it exits into the atmosphere at the base of the handle. In addition, the tool handle may comprise a

trigger device and a throttle valve to control the flow of air into the tool. Furthermore, the rotational coupling system may comprise a means of resistance to impede the absolute free rotation of the handle with respect to the tool housing.

In accordance with the above, it is an object of the present invention to provide a hand-held power tool that allows the handle to rotate about an orthogonal axis perpendicular to the tool housing.

In accordance with the above, it is a further object of the present invention to provide a hand-held power tool in which the trigger mechanism is allowed to be pointed in directions other than towards the front of the power tool.

Brief Description of the Drawings

These and other advantages of the present invention become more readily apparent upon reading the following detailed description and upon reference to the drawings to which:

FIG. 1 is a side view of the preferred embodiment of this invention with the handle in the straight-ahead position;

FIG. 2 is a front view of the preferred embodiment

with the handle in its straight-ahead position pursuant to the present invention; and

FIG. 3 is a side view of the preferred embodiment with the handle rotated 90° pursuant to the present invention.

Detailed Description of the Preferred Embodiments

Referring now to the drawings and more particularly to FIG. 1, there is shown a side view of a hand-held power tool 10 with the handle 14 in the straight-ahead position. The unit basically comprises a motor housing unit 12, a handle 14 and a rotational coupling system 16. The motor housing unit 12 extends along a longitudinal axis 11 and comprises a tool attachment area 68 at the forward end of the axis 11, and a motor 13 at the rear end of the axis 11.

The rotational coupling system 16 interconnects the motor housing 12 to the handle 14 and provides a means by which the handle 14 can rotate axially beneath the motor housing 12. Rotation occurs about an orthogonal axis 15 that is perpendicular to the motor housing's longitudinal axis 11. The coupling system comprises a circular cross section ring 20, a machined groove in the handle 22, O-rings 24, gasket 26, and seal passages 28 and 30. These components provide a relatively frictionless means by

which handle 14 can rotate about the orthogonal axis 15 independent of motor housing 12.

The coupling system 16 also comprises wavey spring 32 which loads the handle outward against the ring 20 and flange 38. The load is great enough to permit the tool 10 to be positioned on the work without the handle 14 turning relative to the motor housing 12 freely, but light enough for the operator to rotate the handle 14 to the desired position. The ideal load is between 20 and 30 inch pounds, however, depending on the particular application, that range may vary.

In the preferred embodiment, the hand tool 10 is powered via compressed air. This is accomplished as follows. Air enters through inlet bushing 39, passes through the throttle valve 40, through passage 28, and to a reverse valve 44. Air inlet bushing 39 may be secured to the tool handle 14 by means of a pin 17 and a groove 19. This permits the inlet to turn freely relative to the handle 14.

With the valve in the forward position, air passes through valve port 45 to port 46 (see FIG. 2) in the motor housing 12, then through port 48 in the rear cover of the motor housing 12, causing the motor 13 to operate in the clockwise direction.

In this embodiment, there may be two means by which air can exhaust from the motor housing 12. First, there

is a main exhaust which exhausts air via port 58 and through circular handle chamber 30. Exhaust air then continues through handle port 66, then through diffuser 62, and into the atmosphere.

A second type of exhaust air, referred to as residual exhaust air, passes through air feed holes on the exhaust side of the motor 13, through the motor housing port 52 (see FIG. 2), past reverse valve 44 and into a circular chamber 30 in the top of the handle 14. The residual exhaust is then exhausted into the atmosphere in the same manner as the main exhaust air (i.e., through handle port 60 and diffuser 62).

As shown in FIG. 1, the tool is depicted in its standard "straight-ahead" position. That is, the trigger 70 is pointed in the same direction as the tool attachment device 68 on the front of motor housing 12. This is the position that such tools are normally fixed for use.

The tool attachment device 68 may comprise a square drive anvil, a chuck, or any other device which will allow for the attachment of sockets, wrenches, drill bits, or any other rotating attachment apparatus.

Referring now to FIG. 2, a partial cross sectional front view of the tool is shown. Handle 14 is shown with trigger 70 facing forward. Motor housing 12 is also shown with tool attachment device 68 shown facing the

forward position.

FIG. 3 depicts the tool with the handle rotated 90°. Handle 14 is shown (along with trigger 70) facing in a leftward direction, while motor housing 12 (along with tool attachment device 68) is shown facing the forward direction. Thus, as depicted in this diagram, handle 14 and the tool housing 12 can be set to face in different directions. This allows the user to adjust the tool to obtain the correct wrist/hand position for the variety of jobs he or she may be doing.

Because of the design of the air intake and exhaust systems, along with the rotational coupling system 16, compressed air can still reach the motor housing through the handle 14 and exhaust out of the handle while the handle 14 is in any rotated position. It should also be recognized that handle 14 is fully rotatable (i.e., 360°) about the tool housing 12. This allows for an unlimited number of handle positions. It should also be recognized that the base of the handle 14 may be constructed such that it is cocked in a slightly backward position as shown in FIGS. 1 & 3.

In addition, it should also be recognized that the handle 14 rotates about an orthogonal axis 15 (see FIG. 1) that in the preferred embodiment is exactly perpendicular to the longitudinal axis 11 (see FIG. 1) of the motor housing 12. It is possible nonetheless to

incorporate a system wherein the handle rotates about an axis that is not exactly perpendicular to the motor housing. In other words, the rotational coupling system which connects motor housing 12 to handle 14 could be constructed skewed, or angularly offset, to allow for a different axis of rotation.

Finally, it should also be recognized that the motor housing 12 and the handle 14 are co-planar. However, it is envisioned that a system could be utilized in which the motor housing 14 and the handle were not co-planar.

As depicted in the previous three figures, the tool motor is driven by compressed air. However, it is envisioned that this rotatable handle system could be used for any fluid-driven power tool. The rotatable handle system could also be used on tools powered by electricity.

The foregoing description of the preferred embodiments of the invention have been presented for purposes of illustration description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and obviously many modifications and variations are possible in light of the above teaching. Such modifications and variations that may be apparent to a person skilled in the art are intended to be included within the scope of this invention as defined by the accompanying claims.

I claim:

1. A hand held power tool comprising:

a housing comprising a motor, said motor being rotatable about a longitudinal axis; and

a handle mounted to said housing along an orthogonal axis perpendicular to said longitudinal axis, said handle being axially rotatable about said orthogonal axis.

2. The power tool of claim 1 wherein said tool is powered by compressed air.

3. The power tool of claim 2 wherein said compressed air enters the tool through an inlet bushing in the handle.

4. The power tool of claim 2 wherein said handle comprises a trigger device and a throttle valve.

5. The power tool of claim 1 further comprising a circular cross section ring and at least one o-ring.

6. The power tool of claim 1 further comprising a wavey spring, wherein said wavey spring causes a resistance to the axial rotation of said handle relative to said housing.

7. The power tool of claim 1 wherein said handle is cocked backward at an angle between 0 and 45 degrees.

8. A hand held fluid driven power tool comprising:

a motor housing comprising a motor which rotates axially about a longitudinal axis, a motor housing intake port, and a motor housing exhaust port;

a handle positioned below said motor housing along an orthogonal axis perpendicular to said longitudinal axis, said handle comprising a handle inlet port and a handle outlet port; and

a rotational coupling system connecting said handle to said motor housing allowing said handle to axially rotate about said orthogonal axis independent of said motor housing.

9. The power tool of claim 8 wherein said rotational coupling system comprises a first fluid passage system that links said handle inlet port to said motor housing intake port and a second fluid passage system that links said motor housing exhaust port to said handle outlet port.

10. The power tool of claim 8 wherein said handle further comprises an inlet bushing secured to the bottom

of said handle, said bushing providing a fluid passage to said handle inlet port.

11. The power tool of claim 8 wherein said handle further comprises a trigger apparatus and throttle valve.

12. The power tool of claim 8 wherein said coupling system comprises a reverse valve and a valve port.

13. The power tool of claim 8 wherein said handle further comprises a diffuser.

14. The power tool of claim 8 wherein said coupling system comprises a circular cross section ring, at least one o-ring, and a gasket.

15. The power tool of claim 8 wherein said coupling system comprises a resistance device, said resistance device suitable to impede free rotation of said handle about said orthogonal axis.

16. A hand held power tool comprising:

a tool housing comprising a front end and a rear end, said front end adaptable for attaching a rotational tool device;

a handle extending radially outward from said tool

housing; and

a rotational coupling system connecting said handle to said tool housing wherein said coupling system provides for independent axial rotation of said handle about an axis which is angularly offset and co-planar to said tool housing.

17. The power tool of claim 16 wherein said handle comprises a trigger.

18. The power tool of claim 16 wherein said tool housing further comprises a motor.

19. The power tool of claim 16 wherein said tool is powered by compressed air.

20. The power tool of claim 16 wherein said front end of said tool housing comprises a square drive anvil.

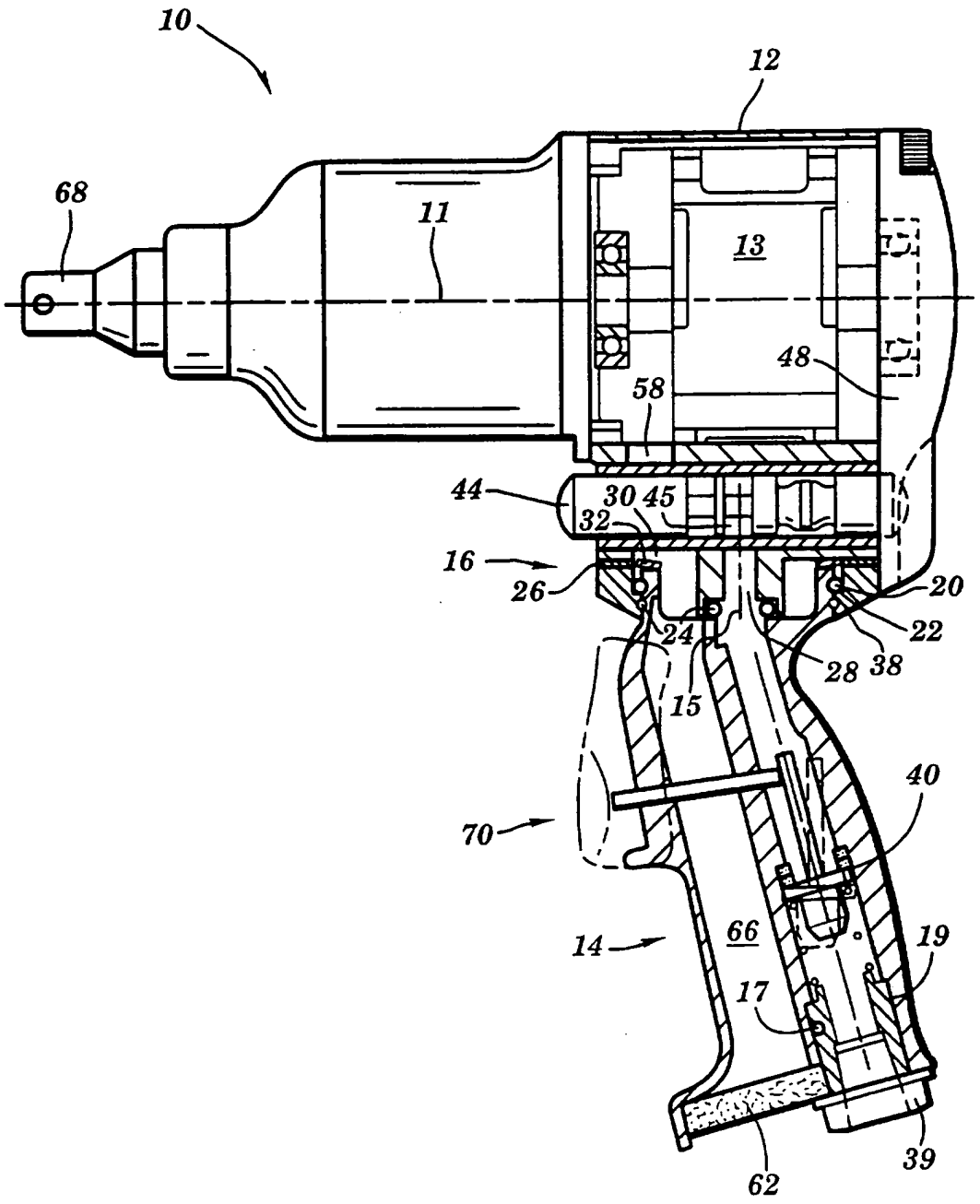
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FIG. 1

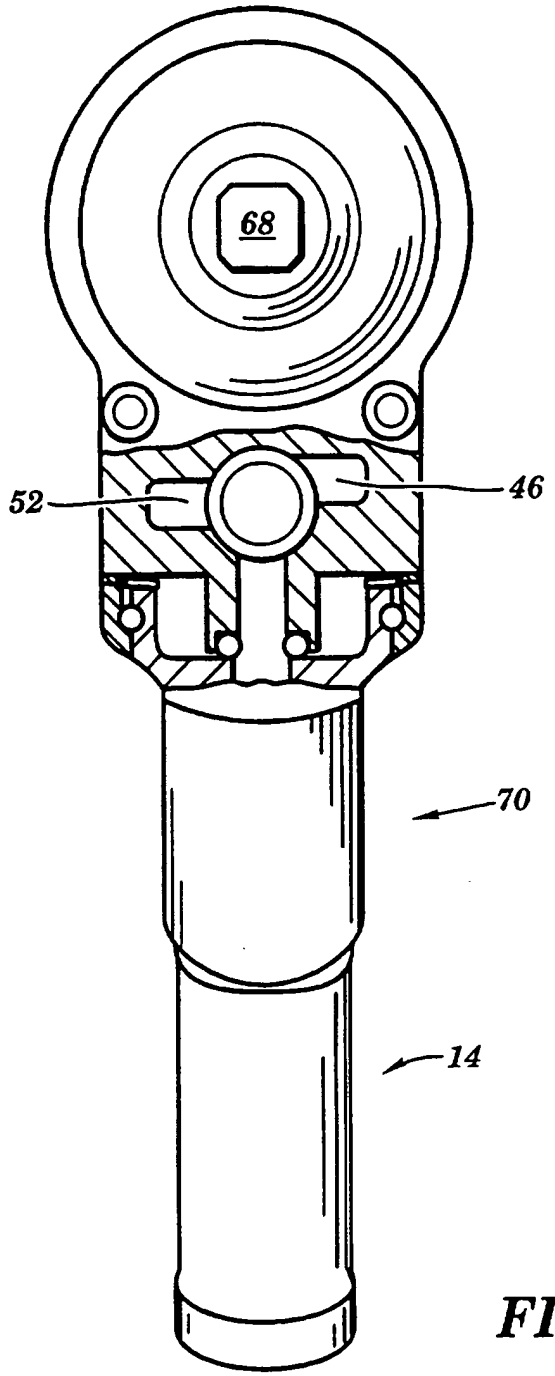

FIG. 2

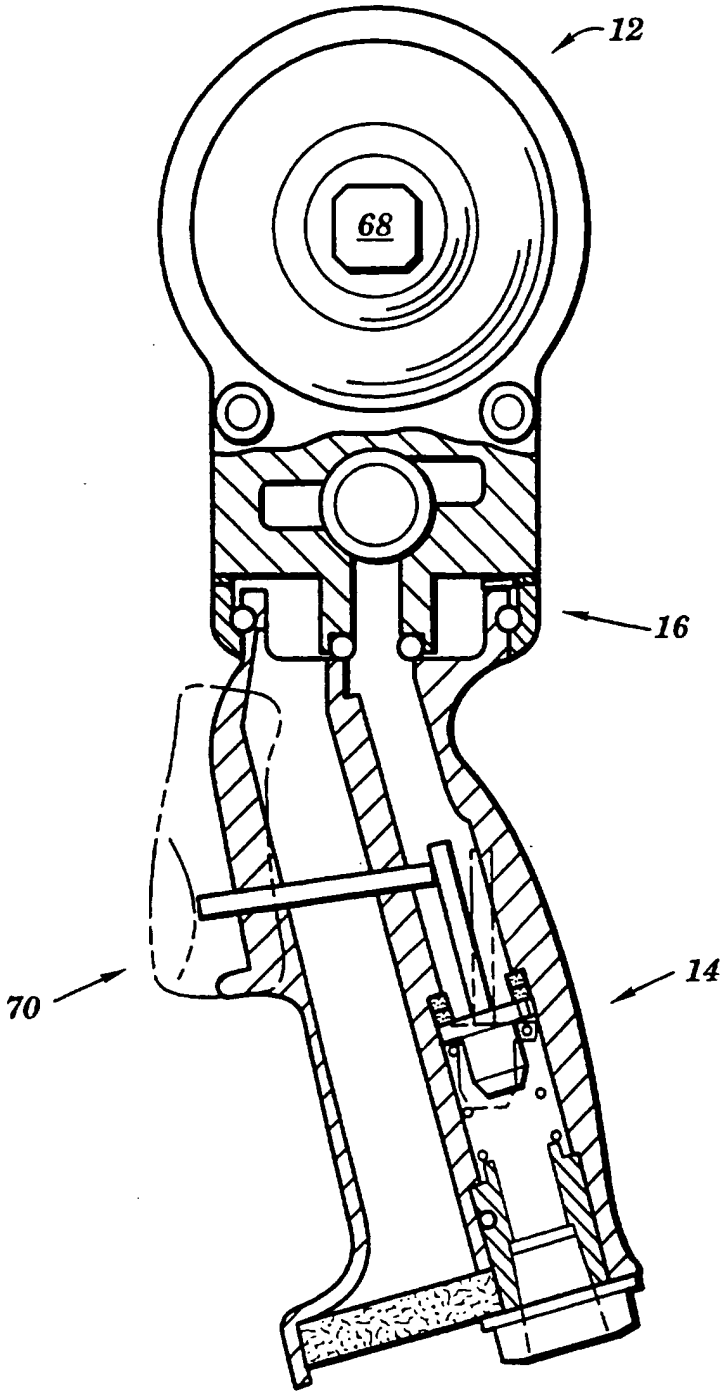

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/15058

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B25D 17/04; B23B 45/04

US CL :173/169, 170, 218

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 173/168, 169, 170, 217, 218

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- A	US 3,571,874 A (VON ARX) 23 March 1971, col. 2, lines 28-56.	1-7, 16-20 --- 8-15
X --- A	US 2,976,436 A (ANTON) 21 March 1961, col. 2, lines 45-64, see Figure 6.	1, 16 --- 2-15, 17-20
X --- Y --- A	US 5,372,420 A (VAN DEURSEN et al.) 13 December 1994, col. 3, lines 40-62.	16-18 --- 20 --- 1-15, 19
A	US 4,778,015 A (JACOBSSON) 18 October 1988.	1-20
A	US 4,643,263 A (KARDEN) 17 February 1987.	1-20

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4,036,085 A (SJOSTRAND et al.) 19 July 1977.	1-20
A	US 3,847,229 A (WANNER et al.) 12 November 1974.	1-20
A	US 3,077,547 A (METKO) 12 February 1963.	1-20